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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/082,909 | 02/26/2002 | Darrel Lee Turner | 034405-9016-00 | 2670 |

7590 05/27/2004

Timothy M. Kelley
Michael Best & Friedrich LLP
100 East Wisconsin Avenue
Milwaukee, WI 53202-4108

EXAMINER

WATTS, DOUGLAS D

ART UNIT PAPER NUMBER

3724

DATE MAILED: 05/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

RECEIVED

JUN 15 2004

TECHNOLOGY CENTER 3700

Office Action Summary

Application No.

10/082,909

Applicant(s)

TURNER ET AL

Examiner

Douglas D. Watts

Art Unit

3724

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 3/10/04.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 and 19-21,30-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-15 is/are allowed.
- 6) ☒ Claim(s) 1-5,7,9,10,16,20,30-37 and 39 is/are rejected.
- 7) ☒ Claim(s) 6,8,19,21,38 and 40 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 7, 16, 20, 30, 32-33, 36, 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Lazarchik. Applicant claims a process wherein a blank with top bottom and edge surfaces is given a bevel on the edge and the edge formed is repositioned. This is shown by Lazarchik. Note column 3, lines 30-38 and 45-49. Note further that repositioning one edge does not automatically reposition the second edge.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5, 9-10, 31, 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lazarchik. Applicant calls for the use of a stamping die to reposition the edge, work stations and repositioning the edges simultaneously. It is felt that work stations are well known for processes involving plural operations and would be obvious to use with Lazarchik. Further it is felt that the obvious method of making the device of Lazarchik would involve repositioning the edges simultaneously since it would serve no

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purpose to do them sequentially. Also stamping dies are well known for cold working material as is done in the instant case and would be obvious to use.

Allowable Subject Matter

Claims 6, 8, 19, 21, 38, 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 11-15 are allowed. The claimed repositioning of the beveled edges to be asymmetrical is not shown or suggested.

Conclusion

Applicant's arguments are well chosen but moot in view of the newly cited art. Note that the modifications to the claims avoided the art cited in the first Office action.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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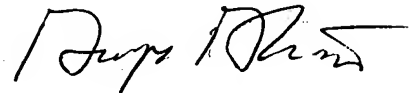
the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas D. Watts whose telephone number is (703) 308-0153. The examiner can normally be reached on Mon.-Thurs..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Allen Shoap can be reached on (703) 308-1082. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DDW
5/24/04



DOUGLAS D. WATTS
PRIMARY EXAMINER

Notice of References Cited

Application/Control No.

10/082,909

Applicant(s)/Patent Under
Reexamination
TURNER ET AL.

Examiner

Douglas D. Watts

Art Unit

3724

Page 1 of 1

U.S. PATENT DOCUMENTS

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Name | Classification |
|---|---|--|-----------------|------------------|----------------|
| | A | US-5,201,253 | 04-1993 | Lazarchik et al. | 76/116 |
| | B | US- | | | |
| | C | US- | | | |
| | D | US- | | | |
| | E | US- | | | |
| | F | US- | | | |
| | G | US- | | | |
| | H | US- | | | |
| | I | US- | | | |
| | J | US- | | | |
| | K | US- | | | |
| | L | US- | | | |
| | M | US- | | | |

FOREIGN PATENT DOCUMENTS

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Country | Name | Classification |
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| | S | | | | | |
| | T | | | | | |

NON-PATENT DOCUMENTS

| * | | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|---|
| | U | |
| | V | |
| | W | |
| | X | |

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

USPTO TO PROVIDE ELECTRONIC ACCESS TO CITED U.S. PATENT REFERENCES WITH OFFICE ACTIONS AND CEASE SUPPLYING PAPER COPIES

In support of its 21st Century Strategic Plan goal of increased patent e-Government, beginning in June 2004, the United States Patent and Trademark Office (Office or USPTO) will begin the phase-in of its E-Patent Reference program and hence will: (1) **provide downloading capability of the U.S. patents and U.S. patent application publications cited in Office actions** via the E-Patent Reference feature of the Office's Patent Application Information Retrieval (PAIR) system; and (2) **cease mailing paper copies of U.S. patents and U.S. patent application publications with Office actions** (in applications and during reexamination proceedings) except for citations made during the international stage of an international application under the Patent Cooperation Treaty (PCT). In order to use the new E-Patent Reference feature applicants must: (1) obtain a digital certificate and software from the Office; (2) obtain a customer number from the Office; and (3) properly associate patent applications with the customer number. Alternatively, copies of all U.S. patents and patent application publications can be accessed without a digital certificate from the USPTO web site, from the USPTO Office of Public Records, and from commercial sources. The Office will continue the practice of supplying paper copies of foreign patent documents and non-patent literature with Office actions. Paper copies of cited references will continue to be provided by the USPTO for international applications during the international stage.

Schedule

| | |
|-------------|-------------------------------|
| June 2004 | TCs 1600, 1700, 2800 and 2900 |
| July 2004 | TCs 3600 and 3700 |
| August 2004 | TCs 2100 and 2600 |

All U.S. patents and U.S. patent application publications are available on the USPTO web site. However, a simple system for downloading the cited U.S. patents and patent application publications has been established for applicants, called the E-Patent Reference system. As E-Patent Reference and Private PAIR require participating applicants to have a customer number, retrieval software and a digital certificate, all applicants are strongly encouraged to contact the Patent Electronic Business Center to acquire these items. To be ready to use this system by June 1, 2004, contact the Patent EBC as soon as possible by phone at 866-217-9197 (toll-free), 703-305-3028 or 703-308-6845 or electronically via the Internet at ebc@uspto.gov.

Other Options

The E-Patent Reference function requires the applicant to use the secure Private PAIR system, which establishes confidential communications with the applicant. Applicants using this facility must receive a digital certificate, as described above. Other options for obtaining patents which do not require the digital certificate include the USPTO's free Patents on the Web program (<http://www.uspto.gov/patft/index.html>). The USPTO's Office of Public Records also supplies copies of patents for a fee (<http://ebiz1.uspto.gov/oems25p/index.html>). Commercial sources also provide U.S. patents and patent application publications.

For complete instructions see the Official Gazette Notice, USPTO TO PROVIDE ELECTRONIC ACCESS TO CITED U.S. PATENT REFERENCES WITH OFFICE ACTIONS AND CEASE SUPPLYING PAPER COPIES, on the USPTO web site.

NOTICE OF OFFICE PLAN TO CEASE SUPPLYING COPIES OF CITED U.S. PATENT REFERENCES WITH OFFICE ACTIONS, AND PILOT TO EVALUATE THE ALTERNATIVE OF PROVIDING ELECTRONIC ACCESS TO SUCH U.S. PATENT REFERENCES

Summary

The United States Patent and Trademark Office (Office or USPTO) plans in the near future to: (1) cease mailing copies of U.S. patents and U.S. patent application publications (US patent references) with Office actions except for citations made during the international stage of an international application under the Patent Cooperation Treaty and those made during reexamination proceedings; and (2) provide electronic access to, with convenient downloading capability of, the US patent references cited in an Office action via the Office's private Patent Application Information Retrieval (PAIR) system which has a new feature called "E-Patent Reference." Before ceasing to provide copies of U.S. patent references with Office actions, the Office shall test the feasibility of the E-Patent Reference feature by conducting a two-month pilot project starting with Office actions mailed after December 1, 2003. The Office shall evaluate the pilot project and publish the results in a notice which will be posted on the Office's web site (www.USPTO.gov) and in the Patent Official Gazette (O.G.). In order to use the new E-Patent Reference feature during the pilot period, or when the Office ceases to send copies of U.S. patent references with Office actions, the applicant must: (1) obtain a digital certificate from the Office; (2) obtain a customer number from the Office, and (3) properly associate applications with the customer number. The pilot project does not involve or affect the current Office practice of supplying paper copies of foreign patent documents and non-patent literature with Office actions. Paper copies of references will continue to be provided by the USPTO for searches and written opinions prepared by the USPTO for international applications during the international stage and for reexamination proceedings.

Description of Pilot Project to Provide Electronic Access to Cited U.S. Patent References

On December 1, 2003, the Office will make available a new feature, E-Patent Reference, in the Office's private PAIR system, to allow more convenient downloading of U.S. patents and U.S. patent application publications. The new feature will allow an authorized user of private PAIR to download some or all of the U.S. patents and U.S. patent application publications cited by an examiner on form PTO-892 in Office actions, as well as U.S. patents and U.S. patent application publications submitted by applicants on form PTO/SB08 (1449) as part of an IDS. The retrieval of some or all of the documents may be performed in one downloading step with the documents encoded as Adobe Portable Document format (.pdf) files, which is an improvement over the current page-by-page retrieval capability from other USPTO systems.

Steps to Use the New E-Patent Reference Feature During the Pilot Project and Thereafter

Access to private PAIR is required to utilize E-Patent Reference. If you don't already have access to private PAIR, the Office urges practitioners, and applicants not represented by a practitioner, to take advantage of the transition period to obtain a no-cost USPTO Public Key Infrastructure (PKI) digital certificate, obtain a USPTO customer number, associate all of their pending and new application filings with their customer number, install no-cost software (supplied by the Office) required to access private PAIR and E-Patent Reference feature, and make appropriate arrangements for Internet access. The full instructions for obtaining a PKI digital certificate are available at the Office's Electronic Business Center (EBC) web page at: <http://www.uspto.gov/ebc/downloads.html>. Note that a notarized signature will be required to obtain a digital certificate.

To get a Customer Number, download and complete the Customer Number Request form, PTO-SB125, at: <http://www.uspto.gov/web/forms/sb0125.pdf>. The completed form can then be transmitted by facsimile to the Electronic Business Center at (703) 308-2840, or mailed to the address on the form. If you are a registered attorney or patent agent, then your registration number must be associated with your customer number. This is accomplished by adding your registration number to the Customer Number Request form. A description of associating a customer number with an application is described at the EBC web page at: http://www.uspto.gov/ebc/registration_pair.html.

The E-Patent Reference feature will be accessed using a new button on the private PAIR screen. Ordinarily all of the cited U.S. patent and U.S. patent application publication references will be available over the Internet using the Office's new E-Patent Reference feature. The size of the references to be downloaded will be displayed by E-Patent Reference so the download time can be estimated. Applicants and registered practitioners can select to download all of the references or any combination of cited references. Selected references will be downloaded as complete documents as Adobe Portable Document Format (.pdf) files. For a limited period of time, the USPTO will include a copy of this notice with Office actions to encourage applicants to use this new feature and, if needed, to take the steps outlined above in order to be able to utilize this new feature during the pilot and thereafter.

During the two-month pilot, the Office will evaluate the stability and capacity of the E-Patent Reference feature to reliably provide electronic access to cited U.S. patent and U.S. patent application publication references. While copies of U.S. patent and U.S. patent application publication references cited by examiners will continue to be mailed with Office actions during the pilot project, applicants are encouraged to use the private PAIR and the E-Patent Reference feature to electronically access and download cited U.S. patent and U.S. patent application publication references so the Office will be able to objectively evaluate its performance. The public is encouraged to submit comments to the Office on the usability and performance of the E-Patent Reference feature during the pilot. Further, during the pilot period registered practitioners, and applicants not represented by a practitioner, are encouraged to experiment with the feature, develop a proficiency in using the feature, and establish new internal processes for using the new access to the cited U.S. patents and U.S. patent application publications to prepare for the anticipated cessation of the current Office practice of supplying copies of such cited

references. The Office plans to continue to provide access to the E-Patent Reference feature during its evaluation of the pilot.

Comments

Comments concerning the E-Patent Reference feature should be in writing and directed to the Electronic Business Center (EBC) at the USPTO by electronic mail at eReference@uspto.gov or by facsimile to (703) 308-2840. Comments will be posted and made available for public inspection. To ensure that comments are considered in the evaluation of the pilot project, comments should be submitted in writing by January 15, 2004.

Comments with respect to specific applications should be sent to the Technology Centers' customer service centers. Comments concerning digital certificates, customer numbers, and associating customer numbers with applications should be sent to the Electronic Business Center (EBC) at the USPTO by facsimile at (703) 308-2840 or by e-mail at EBC@uspto.gov.

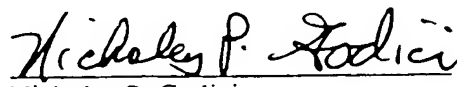
Implementation after Pilot

After the pilot, its evaluation, and publication of a subsequent notice as indicated above, the Office expects to implement its plan to cease mailing paper copies of U.S. patent references cited during examination of non provisional applications on or after February 2, 2004; although copies of cited foreign patent documents, as well as non-patent literature, will still be mailed to the applicant until such time as substantially all applications have been scanned into IFW.

For Further Information Contact

Technical information on the operation of the IFW system can be found on the USPTO website at <http://www.uspto.gov/web/patents/ifw/index.html>. Comments concerning the E-Patent Reference feature and questions concerning the operation of the PAIR system should be directed to the EBC at the USPTO at (866) 217-9197. The EBC may also be contacted by facsimile at (703) 308-2840 or by e-mail at EBC@uspto.gov.

Date: 12/1/03


Nicholas P. Godici
Commissioner for Patents



US005201253A

United States Patent [19]

Lazarchik et al.

[11] Patent Number: **5,201,253**[45] Date of Patent: **Apr. 13, 1993**[54] **SHAVING SYSTEM**[75] Inventors: **Daniel B. Lazarchik, Boston; Henryk J. Chylinski, Haverhill, both of Mass.**[73] Assignee: **The Gillette Company, Boston, Mass.**[21] Appl. No.: **903,916**[22] Filed: **Jun. 25, 1992**

4,964,214 7/1988 Welsh 30/49
 4,979,298 12/1990 Pesiri 30/49
 4,984,365 1/1991 Leonard 30/49

FOREIGN PATENT DOCUMENTS

598803 10/1959 Italy 30/346.55

Primary Examiner—Douglas D. Watts*Assistant Examiner*—Hwei-Siu Payer*Attorney, Agent, or Firm*—Fish & Richardson**Related U.S. Application Data**

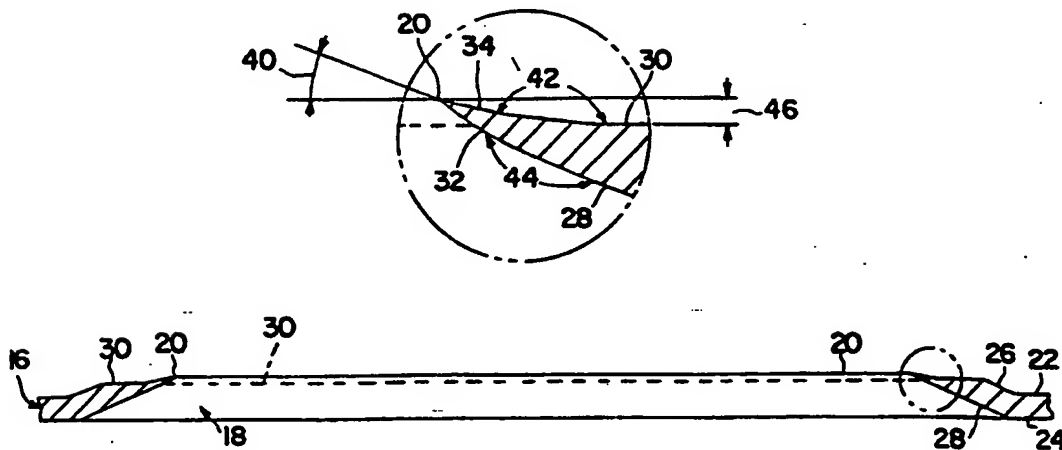
[60] Continuation of Ser. No. 756,343, Sep. 6, 1991, which is a division of Ser. No. 559,646, Jul. 30, 1990, Pat. No. 5,088,195.

[51] Int. Cl.⁵ **B21K 21/00**[52] U.S. Cl. **76/116; 76/DIG. 8; 72/379.2; 30/49**[58] Field of Search **76/116, 101.1, DIG. 8; 30/43, 49, 346.55, 346.61; 72/379.2**[56] **References Cited****U.S. PATENT DOCUMENTS**

1,877,758 9/1932 Kylberg 76/DIG. 8
 2,182,067 12/1939 Bruecker 76/116
 2,598,711 6/1952 Musso 30/346.61
 2,614,321 10/1952 Ackerman 30/49
 3,216,286 11/1965 Heyek 76/116
 3,702,026 11/1972 Scholin 30/49
 4,807,360 2/1989 Cerier 30/49
 4,875,288 10/1990 Trotta 30/49

[57] **ABSTRACT**

A shaving system that includes a holder and a blade member secured to the holder. The blade member has an aperture that defines an annular sharpened edge with main facet portions that converge at an angle of less than 30° and supplemental facet portions that are extensions of the main facet portions and define an ultimate tip defining portion that has an included angle of less than 30°. The supplemental facet portions are offset in the same direction from the main facet portions each at an angle of less than 175°, the outer main facet portion defines a shaving plane, the ultimate tip is disposed above the shaving plane less than 0.1 millimeter, and the bisector of the included angle defined by the supplementary facets is disposed at an angle to the shaving plane in the range of 15°–35°.

10 Claims, 2 Drawing Sheets

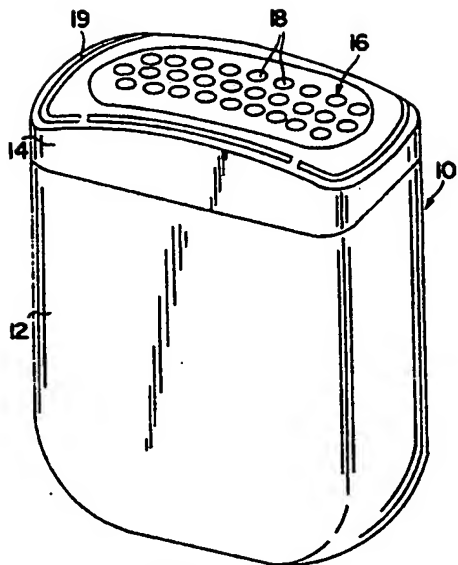


FIG. 1

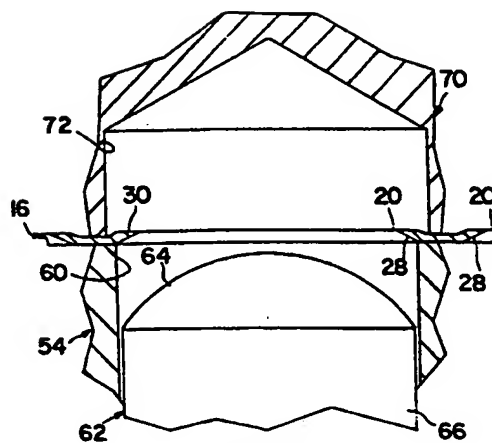


FIG. 7

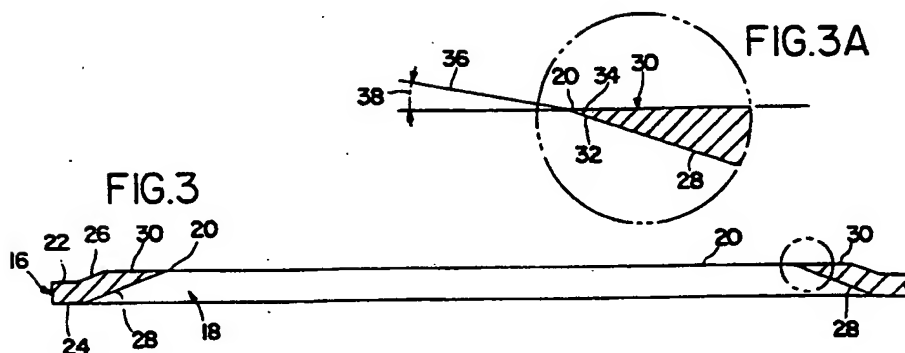


FIG. 3

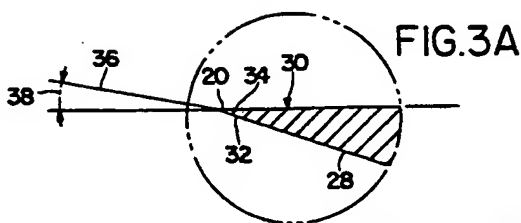


FIG. 3A

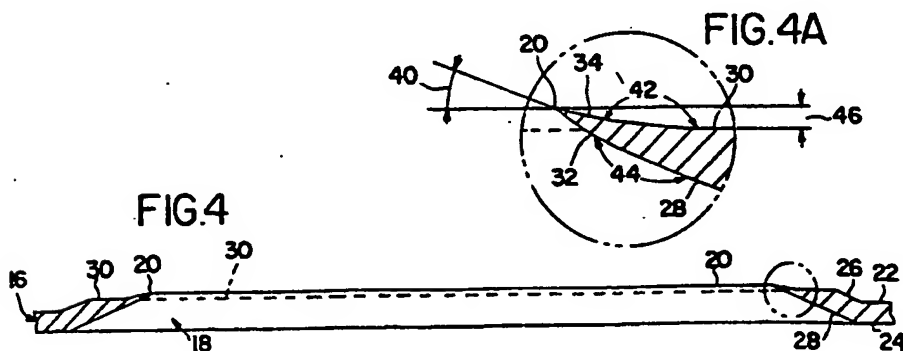


FIG. 4

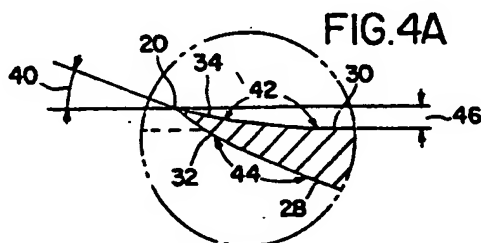


FIG. 4A

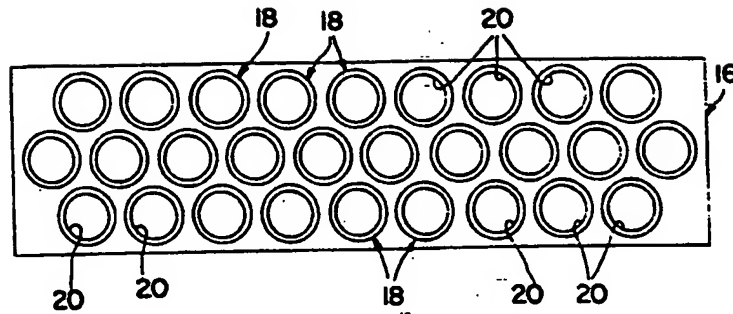


FIG. 2

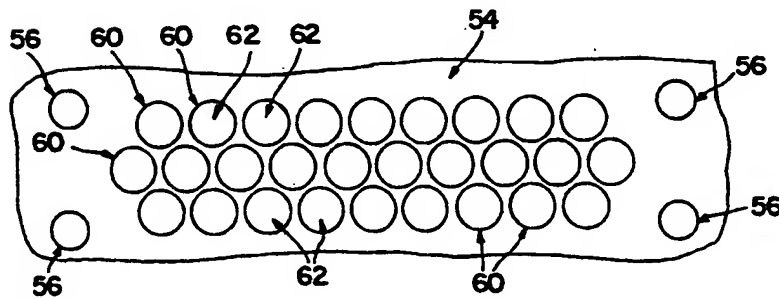


FIG. 6

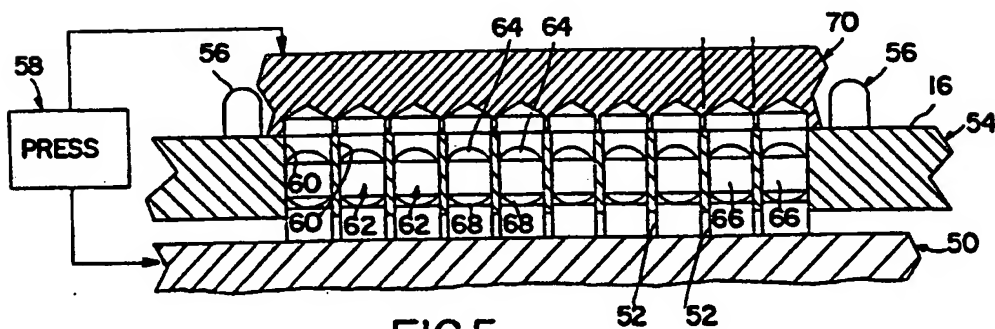


FIG. 5

SHAVING SYSTEM

This is a continuation of copending application Ser. No. 07/756,343, filed Sep. 6, 1991, which is a division of copending application Ser. No. 07/559,646, filed Jul. 30, 1990, U.S. Pat. No. 5,088,195.

This invention relates to shaving systems, and more particularly to shaving systems that employ a blade structure with annular cutting edge structure, and to methods and apparatus of manufacturing such blade structures.

A number of shaving systems with blade structures that have annular cutting edge structure have been proposed, see for example Ackerman, U.S. Pat. No. 2,614,321, Musso, U.S. Pat. No. 3,465,436, Scholin, U.S. Pat. No. 3,702,026, Cerier, U.S. Pat. No. 4,807,360, Trotta, U.S. Pat. No. 4,875,288 and PCT Published Application PCT/GB88/00014. In general, shaving characteristics of such shaving systems have not been entirely satisfactory.

In accordance with one aspect of the invention, there is provided a shaving system that includes a holder and a blade member secured to the holder. The blade member has an aperture that defines an annular sharpened edge that is defined by main facet portions that converge at an angle of less than 30° and supplemental facet portions that are extensions of the main facet portions and define an ultimate tip defining portion that has an included angle of less than 30°. The supplemental facet portions are offset in the same direction from the main facet portions each at an angle of less than 175°, the outer main facet portion defines a shaving plane, the ultimate tip is disposed above the shaving plane less than 0.1 millimeter, and the bisector of the included angle defined by the supplementary facets is disposed at an angle to the shaving plane in the range of 15°-35°.

The blade structure may take a variety of forms, and the apertures may be of circular, elongated or other shape. In preferred embodiments, the aperture has a width dimension (the distance between opposed sharpened edges of the same aperture) of less than six millimeters; the radial length dimension of the main facet portion that defines the shaving plane is at least about twice the radial length of the contiguous supplemental facet portion; the supplemental facet portions are offset in the same direction from the main facet portions each at an angle in the range of 135°-175°; and the ultimate tip is disposed less than 0.05 millimeter above the shaving plane.

In a particular embodiment, the blade member is a foil member that has a thickness of less than 0.3 millimeter, a plurality of apertures are in the foil member, and each aperture has an annular sharpened edge with supplemental facet portions that are each about 0.1 millimeter in radial length and that define an ultimate tip that is disposed about 0.03 millimeter above the shaving plane.

In accordance with another aspect of the invention, there is provided a method of manufacturing a razor blade that includes the steps of providing a blade member with an annular aperture therein, sharpening the edge of the aperture to provide an annular shaving edge, and cold-working the portion of the annular edge portion immediately adjacent to the ultimate sharpened tip to bend that edge portion and mechanically displace the ultimate tip to provide a shaving angle relative to the plane of the blade member in the range of 15°-35° and an exposure in the range of about 0.01-0.1 millime-

ter. The cold-working and mechanical displacement of the sharpened edge may be performed by various mechanisms such as linear punches, spinning mechanisms, and ultrasonic vibration.

In a particular embodiment, the method includes the steps of providing a metal strip with an array of apertures therein, sharpening the edges of the apertures to provide an array of annular shaving edges, and using punch and die structure to impart a permanent bend in the portion of each annular edge portion immediately adjacent to the ultimate sharpened tip of each annular sharpened edge to provide supplemental facets that define a shaving angle of about 5°, and an exposure of about 0.03 millimeter.

In accordance with another aspect of the invention, there is provided apparatus for manufacturing razor blade structure that has an aperture with an annular sharpened edge, the apparatus including punch structure, a punch member upstanding from the punch structure of configuration identical to the configuration of the annular sharpened edge and of slightly greater dimension, die structure having a die recess of configuration identical to the configuration of the annular sharpened edge and of slightly greater dimension than the punch member, structure for positioning the razor blade structure between the punch and die structures, and structure for moving the punch and die structures towards one another to cold-work the portion of the annular edge portion immediately adjacent to the ultimate sharpened tip and mechanically displace the ultimate tip and provide a shaving angle in the range of 15°-35° and an exposure in the range of about 0.01-0.1 millimeter.

In a particular embodiment, the razor blade structure is a metal foil strip with an array of apertures, pressure plate structure cooperates with the punch structure and includes an array of apertures corresponding to the apertures in the metal foil strip, the punch structure carries an array of floating punch members that are disposed in the apertures of the pressure plate structure, and the apparatus imparts a permanent bend in the portion of each annular edge portion immediately adjacent to the ultimate sharpened tip of each annular sharpened edge to provide supplemental facets that define a shaving angle relative to the plane of the metal strip of about 25°, and an exposure of about 0.03 millimeter.

Other features and advantages of the invention will be seen as the following description of particular embodiments progresses, in conjunction with the drawings, in which:

FIG. 1 is a perspective view of a shaving system in accordance with the invention;

FIG. 2 is a plan view of a foil member employed in the shaving system shown in FIG. 1;

FIG. 3 is an enlarged sectional view of an aperture of the foil member of FIG. 2 after preliminary processing;

FIG. 3A is an enlarged view of a portion of the view shown in FIG. 3;

FIG. 4 is an enlarged sectional view (similar to FIG. 3) of an aperture of the foil member of FIG. 2 after supplementary processing;

FIG. 4A is an enlarged view (similar to FIG. 3A) of a portion of the view shown in FIG. 4, showing the configuration of the ultimate edge of a sharpened aperture of the foil member shown in FIG. 2;

FIG. 5 is a sectional view of a punch and die mechanism employed in the forming of the razor blade as shown in FIGS. 2 and 4;

FIG. 6 is a plan view of the edge upturning pressure plate assembly employed in the forming of the razor blade as shown in FIGS. 2 and 4; and

FIG. 7 is an enlarged sectional view of a portion of one stage of the punch and die mechanism shown in FIG. 5.

DESCRIPTION OF PARTICULAR EMBODIMENTS

The shaving system 10 shown in FIG. 1 includes handle portion 12 that is secured to cap portion 14. Carried by cap portion 14 is metal foil strip 16 that has an array of apertures 18 and skin conditioning number 19 that extends thereabout. Shaving system 10 has a height of about 6.5 centimeters, a width of about 5.7 centimeters and a depth of about 2.4 centimeters.

The metal foil strip 16, shown in FIG. 2, is manufactured of 0.1 millimeter thick strip steel and has a length of about 4.3 centimeters and a width of about 1.2 centimeters. Formed in foil strip 16 are an array of twenty-eight circular apertures 18 disposed in three rows that are spaced about four millimeters on center. Each aperture 18 has a diameter of about three millimeters and the circular edge 20 is sharpened to a shaving edge, as indicated in FIG. 3. In other foil strip embodiments, circular apertures are disposed in different arrays and have diameters in the range of 2.0-3.5 millimeters, and the circular edges of the several apertures are similarly processed in manner described below.

As shown in FIGS. 3 and 4, the body of strip 16 has upper surface 22 and lower surface 24. Surrounding each aperture 18 are annular portions 26, 28 that are inclined at an angle of about 20° to surfaces 22 and 24 respectively, and are formed by mechanical displacement and coining processes. Upper inclined portions 26 are then abraded in grinding and honing operations to form facets 30 that are parallel to and offset about 0.03 millimeter from surface 22, and have radial lengths of about 0.3 millimeter each. Facets 30 are parallel to the plane of strip 16 and define a shaving plane.

Further enlarged views are shown in FIGS. 3A and 4A. As shown in those figures, the ultimate tip 20 of each blade aperture 18 is defined by surfaces 32, 34 that are disposed at an angle of about 20° to each other and are extensions of surfaces 28, 30 respectively. After preliminary processing, as indicated in FIGS. 3 and 3A, the half angle between surfaces 32, 34, as indicated by line 36 is such that line 36 is inclined at an angle of about 10° to the shaving plane defined by surface 30. The foil strip 16 is then further processed by cold-working and bending the steel immediately adjacent ultimate tip to shift the ultimate edge upwardly such that the inclination of the half angle line 36 between surfaces 32, 34 is increased to an angle 40 of about 25° to the shaving plane of strip 16. In this condition, the angle 42 between surfaces 30 and 34 is about 165° and the angle 44 between surfaces 28 and 32 is about 195°. Facet surfaces 32, 34 each have a length of about 0.1 millimeter and ultimate tip 20 is offset (exposure 46) about 0.03 millimeter above facet surface 30.

The edge geometry illustrated in FIGS. 4 and 4A is formed with the punch and die mechanism shown in FIGS. 5-7. That mechanism includes punch plate 50 that is mounted in fixed location and has an array of upstanding posts 52 corresponding to the configuration of apertures 18 in foil strip 16. Disposed above punch plate 50 is spring-biased pressure plate 54 that has upstanding pilot posts 56 that receive pilot holes (not

shown) in foil strip 16 so that strip 16 is accurately located relative to guide channels 60 (of about 3.7 millimeter diameter) in pressure plate 54. Received in channels 60 are hardened steel floating punch members 62 (of about 3.4 millimeter diameter), each of which has a spherical upper surface 64 of about 2.4 millimeter radius, cylindrical body portion 66 of about 3.4 millimeter diameter, and spherical lower surface 68 whose center of radius is coincident with the center of radius of upper surface 64. Die plate 70 has an array of die recesses 72 of about four millimeters diameter each corresponding to an aperture 18 in foil strip 16.

In operation, strip 16 is positioned on pressure plate 54 as aligned by guide posts 56, and die plate 70 is moved downward by conventional mechanism 58, capturing strip 16 as indicated in FIGS. 5 and 7. As pressure plate 54 is moved downwardly by die plate 70, the surfaces 64 of floating punch members 62 engage the ultimate sharpened edges 20 of apertures 18 at a contact angle of about 40° and bend supplemental facets 32, 34 upwardly in metal-working action, shifting the ultimate edges 20 uniformly upwardly about 0.03 millimeter to provide the stable blade edge configuration illustrated in FIGS. 4 and 4A (an exposure of about 0.03 millimeter and a shaving angle of about 25°).

Coatings of metal and/or polymer may be applied to the sharpened edges, as desired and the processed strip is assembled in shaving system 10. The resulting shaving system exhibits quality shaving characteristics and good shaving life.

While particular embodiments of the invention have been shown and described, various modifications thereof will be apparent to those skilled in the art, and therefore it is not intended that the invention be limited to the disclosed embodiments, or to details thereof, and departures may be made therefrom within the spirit and scope of the claims.

What is claimed is:

1. A method of manufacturing a razor blade comprising the steps of
providing a blade member with an aperture therein, sharpening the edge of said aperture to provide an annular shaving edge with a first portion that defines a main facet and a second portion that has an ultimate sharpened tip, and mechanically displacing said second portion of said annular shaving edge immediately adjacent to said ultimate sharpened tip to provide a shaving angle in the range of 15°-35°, and an exposure in the range of about 0.01-0.1 millimeter.

2. The method of claim 1 wherein said providing step includes the step of providing a blade member with an aperture that has a width dimension of less than six millimeters, said sharpening step provides said first portion with main facet portions on upper and lower surfaces of said blade member, and said mechanical displacing step offsets said second portion from said first portion to provide supplemental facet portions of said annular shaving edge that are offset in the same direction from said main facet portions of said annular shaving edge each at an angle in the range of 135°-175°.

3. The method of claim 2 wherein said mechanically displacing step provides said supplemental facet portions of said annular shaving edge that have a radial length of less than about 0.3 millimeter, and said main facet portions of said annular shaving edge have a radial length of at least twice the radial length of said supplemental facet portions.

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4. The method of claim 1 wherein said providing a blade member step includes providing a blade member in the form of a metal strip with an array of apertures therein,

said sharpening step sharpens the edges of said apertures to provide an array of annular shaving edges, and

said mechanically displacing step includes the use of punch and die structure to impart a permanent bend in a portion of each said annular shaving edge immediately adjacent to the ultimate sharpened tip of each said annular shaving edge to provide supplemental facets that define a shaving angle relative to the plane of said metal strip of about 25° and an exposure of about 0.03 millimeter.

5. The method of claim 4 wherein said metal strip provided by said providing step has at least ten shaving edge defining apertures of circular configuration, said metal strip has a thickness of less than 0.3 millimeter, and each said aperture has a width dimension of less than about six millimeters.

6. A method of manufacturing a razor blade comprising the steps of

providing a planar blade member with an aperture therein,

mechanically displacing the perimeter portion of said blade member surrounding said aperture to provide a raised perimeter portion,

sharpening the edge of said raised perimeter portion of said aperture to provide an annular shaving edge with a first portion that defines a main facet and a second portion that has an ultimate sharpened tip, and

mechanically displacing said second portion of said annular shaving edge immediately adjacent to said ultimate sharpened tip to provide a shaving angle in the range of 15°-35°, and an exposure in the range of about 0.01-0.1 millimeter.

7. The method of claim 6 wherein said providing step includes the step of providing said planar blade member

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with an aperture that has a width dimension of less than six millimeters, said sharpening step provides said first portion with main facet portions on upper and lower surfaces of said blade member, and said mechanical displacing said second portion step offsets said second portion from said first portion to provide supplemental facet portions of said annular shaving edge that are offset in the same direction from said main facet portions of said annular shaving edge each at an angle in the range of 135°-175°.

8. The method of claim 7 wherein said mechanically displacing said second portion step provides said supplemental facet portions of said annular shaving edge that have a radial length of less than about 0.3 millimeter, and said main facet portions of said annular shaving edge have a radial length of at least twice the radial length of said supplemental facet portions.

9. The method of claim 6 wherein said providing step includes providing said planar blade member in the form of a metal strip with an array of apertures therein, said sharpening step sharpens the edges of said apertures to provide an array of annular shaving edges, and

said mechanically displacing said second portion step includes the use of punch and die structure to impart a permanent bend in a portion of each said annular shaving edge immediately adjacent to the ultimate sharpened tip of each said annular shaving edge to provide supplemental facets that define a shaving angle relative to the plane of said metal strip of about 25° and an exposure of about 0.03 millimeter.

10. The method of claim 9 wherein said planar metal strip provided by said providing step has at least ten shaving edge defining apertures of circular configuration, said metal strip has a thickness of less than 0.3 millimeter, and each said aperture has a width dimension of less than about six millimeters.

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